STATUS OF MINERAL RESOURCE INFORMATION FOR THE SAC AND FOX INDIAN RESERVATION, IOWA

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CONTENTS

SUMMARY AND CONCLUSIONS

The Sac and Fox Indian Reservation covers about 3,476 acres in Tama County, east-central Iowa. All of the reservation is owned by the tribe and held in trust by the U.S. Government.

Known mineral resources on the reservation include limestone, fluvial (river-lain) and glacial deposits of clay and sand and gravel, and eolian (wind-blown) loess deposits. There is no record of mineral production from the reservation. All of the reservation surface has been covered by glacial drift from one glacial period, and some parts have been covered by drift from two glacial periods. The glacial material is underlain by limestone deposits in the northwestern corner of the reservation and by shales in the southern portion of the reservation. The Iowa River, which drains the reservation, has a wide flood plain containing large quantities of fluvial soils and sand and gravel. The fluvial and loess deposits provide rich agricultural soils. Sand and gravel deposits along the Iowa River appear to be the best resource for possible development on the reservation.

INTRODUCTION

This report was prepared for the Bureau of Indian Affairs (BIA) by the U.S. Geological Survey (USGS) and the U.S. Bureau of Mines (USBM) under an Interagency Agreement to compile and summarize available information on the geology, mineral resources, and potential for economic development of certain Indian lands. Source material included published and unpublished reports, as well as personal communications. No fieldwork was done.

The Sac and Fox (Mesquakies) Indian Reservation covers 3,476 acres (U.S. Dept. of Commerce, 1974) in two settlements within Tama County, the main reservation area and the South Farm area. The reservation is in east-central Iowa, about 15 miles southeast of Marshalltown (Figure 1). The reservation was established in 1865 when tribal leaders purchased 80 acres of land in Tama County. Later, additional purchases increased the total acreage of the reservation. The tribe continues to own all reservation land, which now is held in trust by the U.S. Government. No individual land allotments have been made.

The Sac and Fox Tribe leases 705 acres to non-Indian farmers. Population of the tribe is about 924, and the resident population varies from 600-700 people. In 1980, approximately 540 were residing on the reservation at the time of the latest U.S. census. Mineral rights on the reservation are held by the tribe. The reservation lies within the limits of the Kansan and Iowan drift plains and is drained by the Iowa River, which divides the reservation into a northern and southern half. The land consists of flat, timbered bottom land in the southern half and rolling, timbered hills in the northern half. The rich glacial and fluvial deposits on the reservation provide fertile soil for agricultural crops, the primary use of the land. Two agricultural leases totaling 705 acres in aggregate are in effect, providing an annual rental income of $27,000 (Bureau of Indian Affairs, 1980).

Principal cities and towns near the reservation include Tama (population 3,000), Toledo (population 2,356), Marshalltown (population 26,505),

Iowa City (population 47,744), and Cedar Rapids (population 108,987) (Iowa Dept. of Transportation, 1980).

The region has a continental climate: summers are hot, as high as 100º F., and winters are cold, as low as minus 20º F. Annual precipitation ranges from 6 to 20 inches, largely from summer rains.

Facilities and Services

Access roads on the reservation are unimproved dirt roads maintained by the BIA. U.S. Highway 30 passes east-west through the northern portion of the reservation, and U.S. Highway 63 passes north-south to the east of the reservation. County Road E49 provides access to the southern portion of the reservation. Two railroads, the Chicago and Northwestern and the Chicago, Milwaukee, St. Paul, and Pacific, pass through the reservation and provide rail service at Tama, about 3 miles east of the reservation boundary. Truck and bus service also are available in Tama. Commercial airline service is available at Cedar Rapids, about 59 miles east of the reservation, and at Des Moines, about 67 miles west of the area.

A day school operated by the BIA functions on the reservation. Health services are provided at a U.S. Public Health Service clinic in Tama.

Previous Investigations

The Sac and Fox Indian Reservation was included in geologic studies done for the Iowa Geological Survey by White (1870) and Savage (1903). Sand deposits in the general area were evaluated by Wickstrom (1955). No known mineral resource investigations have been conducted exclusively on the Sac and Fox Reservation.

MAP COVERAGE

The Iowa Geological Survey published a geologic map of Tama County by Savage (1903), a geologic map of Iowa by Hershey (1969), and a mineral resource map of Iowa by Dorheim (1970). These maps are available through the Iowa Geological Survey, 123 North Capital, Iowa City, Iowa 52242.

Topographic maps of the Sac and Fox Reservation at a scale of 1:24,000 (7.5-minute quadrangles) include the quadrangle maps of Garwin, Tama, and Montour. Topographic maps of the area at a scale of 1:250,000 are the Des Moines and Waterloo map sheets. Topographic maps are available through the U.S. Geological Survey, Branch of Distribution, P. O. Box 25286, Denver, Colo. 80225.

A county road map showing cultural features of Tama County is available from the Iowa Department of Transportation, 800 Lincoln Way, Ames, Iowa 50010. Scale of this map is 1 inch equals 2 miles.

PHYSIOGRAPHY

The surface of the Sac and Fox Indian Reservation is covered by Kansan and Iowan drift and loess deposits, except where removed by the Iowa River. Topography of the Kansan drift is irregular, because it has been exposed to erosion for a long time. The surface is dissected by an intricate system of drainage channels. The Iowa River

Valley, cut in Kansan drift, has an average width of more than 2 miles. Over this broad plain the river meanders in a series of broad swinging curves. Elevations on the reservation range from 820 feet in the river valley to 980 feet in the hilly area along the river. Most of the land surface is timbered, except in limited areas where it has been cleared for farming.

The South Farm area (Figure 1) is covered by Kansan drift underlain by shales. The land surface is rolling, hilly, and partially timbered.

GEOLOGY

Pleistocene Iowan and Kansan glacial drift and loess and Quaternary alluvium cover the Sac and Fox Reservation and vicinity (Kay, Apfel, and Graham, 1943). The drift ranges in thickness from a few feet to 350 feet. In Tama County, small boulders of fine-grained greenstone make up a major portion of the Kansan Drift (Savage, 1903). Other materials in the drift include clays and deeply weathered granite boulders.

Iowan Drift extends over about 45 percent of Tama County, but it may be absent from parts of the Sac and Fox Reservation (Savage, 1903; Kay and others, 1943). Large boulders in the Iowan Drift of this area are commonly of fresh gray granite, but, in places, complete differentiation is difficult between the Kansan and Iowan drift sheets.

Subsurface data are not available specifically for Tama County, but a generalized stratigraphic section for east-central Iowa indicates the formations known to be or likely to be present in the subsurface in this county (Iowa Geological Survey, 1969). See Figure 2 and Figure 3.

In the northwestern part of the reservation, the beds beneath the glacial drift are part of the Mississippian Kinderhook Series. This series is made up of the Gilmore City Limestone, the Hampton, Starrs Cave, and Prospect Hill formations, and the McCraney Limestone. Together these formations are about 645 feet thick.

Underlying the Kinderhook Series is the Devonian Yellow Spring Group, which includes the English River Formation, the Maple Hill Shale, and the Aplington and Sheffield formations. Beneath the Yellow Springs Group is the Lime Creek Formation; the Cedar Valley Limestone, which contains beds of gypsum; the Wapsipinian Formation, and the LaPorte City Chert. Devonian formations in Iowa are about 550 feet thick. These formations overlie the Silurian Niagaran Series, which includes the Gower and Hopkinton dolomites. The Alexandrian Series is made up of the Kankakee Formation and the Edgewood Dolomite. In this area Silurian strata are about 385 feet in thickness.

The Maquoketa Formation comprises the Ordovician Cincinnatian Series, and overlies the Galena, Decorah, and Platteville Formations of the Mohawkian Series. The St. Peter Sandstone of the Chazyan Series and the Prairie du Chien Formation of the Beekmantown Series complete the Ordovician section, which is approximately 875 feet thick in Iowa.

The Cambrian St. Croixian Series, about 900 feet thick, includes the Jordan Sandstone, the St. Lawrence Formation, and the Franconia, Galesville, Eau Claire, and Mt. Simon Sandstones.

Precambrian rocks in Iowa include granite, gneiss, and gneissoid granite crystalline rocks and pink-coated fine-grained quartzite and some red slate of the Sioux Quartzite.

MINERAL RESOURCES

Mineral resources on the Sac and Fox Reservation are limited to limestone; fluvial (river-lain) soils and sand and gravel deposits; glacial deposits of clay, and sand and gravel; and eolian (wind-blown) loess deposits. Some potential exists for development of sand and gravel deposits along the Iowa River. Areas of potential coal reserves to the southwest do not extend into Tama County. There is no record of mineral production on the reservation.

Limestone

Kinderhook Limestone underlies Kansan and Iowan glacial deposits in the northwestern portion of the reservation. The Kinderhook Limestone is of the Mississippian Series. Three stages of Kinderhook Limestone are exposed along the Iowa River in western Tama County: a fine-grained yellow limestone, a light-colored oolitic limestone, and a brown magnesian limestone. The oolitic bed has been burned for lime production in the past. Polished oolite has a pleasing appearance and stands up well where not exposed to weathering. Because the oolite is a weak stone that crumbles rapidly when exposed to weathering, it is suitable only for interior stonework. In an old quarry 2½ miles northwest of the reservation, in sec. 4, T. 83 N., R. 16 W., a 6-foot layer of oolite is exposed overlying a 23-foot layer of magnesian limestone. At another old quarry in sec. 17, T. 83 N., R. 16 W., 13 miles west of the reservation, there has been production from a 10-foot bed of oolite.

The Kinderhook Limestone is 38 feet thick in S½ sec. 20, T. 83 N., R. 15 W., about ½ mile northeast of the reservation, and occurs at a depth of about 130 feet. In sec. 17, about 1 mile northeast, the limestone is 20 feet thick and buried by 220 feet of glacial drift and loess. Production of Kinderhook Limestone comes from quarries between La Grand and Montour, about 3 miles west of the reservation. Limestone in these quarries is as much as 40 feet thick. In 1979, production of crushed stone from one quarry near La Grand amounted to 204,000 tons. Major uses of the crushed stone production were for dense-graded roadbase stone, surface-treatment aggregate, roadstone, and concrete aggregate.

Fluvial Deposits

Rich fluvial (river-lain) soils have accumulated in the Iowa River Valley by the action of the river currents. The materials composing fluvial deposits are derived from the rocks and glacial deposits in which the Iowa River formed its valley. Fluvial deposits are largely composed of sand and silts, and make up some of the most productive soils in the nation. The Iowa River Valley is a wide belt of fluvial deposits approximately 4 feet deep (Savage, 1903). The fluvial deposits are underlain by a bed of sand and gravel about 30 feet thick that gives the overlying fluvial soils thorough underdrainage.

Primary use of fluvial deposits is as an agricultural top soil. These soils are the most fertile of any

in the county. Soil of this type is abundant in the area, and no commercial market for the material exists at this time.

Glacial Deposits

All of the land surface of the Sac and Fox Reservation has been covered by Pleistocene glacial deposits of Kansan-age drift. In the northern part of the reservation the Kansan drift is covered by later Iowan glacial drift. The Iowa River has cut down through the Iowan deposits into the Kansan deposits. These glacial deposits contain clay and sand and gravel, both of which are found on the reservation.

Clay

Clay deposits of sufficient quality for the manufacture of brick, tile, and pipe are known to exist near the reservation. Brick and tile products have been made in Tama County of clays produced primarily from beds contained within glacial drift. A clay pit formerly was operated on the north bank of the Iowa River east of Tama for brick production at a plant near Tama. Scattered clay deposits exist throughout the glacial-blanketed areas of the county. Two clay beds are exposed in a railroad cut on the reservation in SW¼ sec. 19, T. 83 N., R. 15 W. The upper bed, in Kansan drift, is 24 feet thick and the lower bed, in pre-Kansan soils (possibly Nebraskan drift), is 16 feet thick. The upper bed is approximately 12 feet below the surface (Savage, 1903). The quality of these two clays is not known. There is no commercial clay production in Tama County at present and no apparent market for clay in the area at this time. Clay beds of commercial quality occur approximately 12 miles north of the reservation. These clay beds were mined in the early 1900's. Competition for the pipe market from plastic and concrete pipe producers continues to depress the demand for clay, and further production of clays in Tama County is unlikely.

Sand and Gravel

Sand and gravel deposits are found along the flood plain of the Iowa River and in beds in the Kansan and Iowan drift. Accumulations of sand and gravel also are found around the margin of the glacial extensions. Sand suitable for building purposes occurs at a number of places, including the flood plains along rivers and streams.

In SW¼ sec. 19, T. 83 N., R. 15 W., in a railroad cut, a sand bed 8 feet thick occurs 4½ feet below the ground surface (Savage, 1903). A layer of fine sand 8 to 13 feet thick is in S½NE¼ sec. 30, T. 83 N., R. 15 W., (Wickstrom, 1955) and a bed 3½ to 20 feet thick occurs in SE¼SE¼ sec. 3, T. 82 N., R. 15 W., 2 miles east of the reservation. Sand and gravel currently are being produced from a pit along the Iowa River 1½ miles east of the reservation boundary. Potential exists for development of sand and gravel on the reservation provided a market could be developed in the vicinity of the reservation.

Loess

Eolian loess is a wind blown silt derived from glacial deposits. All of the Sac and Fox Reservation has been covered by the Kansan ice invasion,

and the northern portion of the reservation was also covered by the Iowan invasion. Loess forms a mantle at the surface over all the Kansan drift area and covers with a layer 1 or 2 feet thick, the southernmost portion of Iowan drift in the area. The loess is derived from the finer constituents of the Iowan drift as is evidenced by its color and composition, its geographical relation to the Iowan border, and its superposition sometimes on Kansan drift in some places and on the Iowan in others (Savage, 1903). The loess is largely composed of silt interspersed with numerous beds of finer loess clay. The deposits are fine-grained, yellow, and contain no sand or pebbles. Depths of 15 to 25 feet are recorded within Tama County. Many of the thicker beds include calcareous layers. The deposits of fine-grained loess are forming today wherever dust-laden winds are checked and the silts are deposited. Loess deposits near the reservation vary from 1 foot thick in sec. 4, T. 83 N., R. 16 W., and 4 feet thick in sec. 17, T. 83 N., R. 15 W., to as much as 30 feet thick in sec. 20, T. 83 N., R. 15 W., about 1 mile east of the reservation. On the reservation, loess is 4½ feet thick in SW¼ sec. 19, T. 83 N., R. 15 W.

Loess is used as a mineral filler in road metal and as a fill material in earthen structures such as earth fill dams. The material is available in unlimited quantities throughout Tama and surrounding counties, but demand is limited and development potential is small.

Gypsum

Gypsum is known to occur in subsurface beds of the Devonian Cedar Valley Limestone in Tama County. These beds may be as much as 800-1,200 feet below the surface, and chances for development as an economic resource in the near future appear slight (Dorheim, 1970).

RECOMMENDATIONS FOR FURTHER STUDY

On the basis of available mineral resource information, it appears that no further study is warranted at this time.

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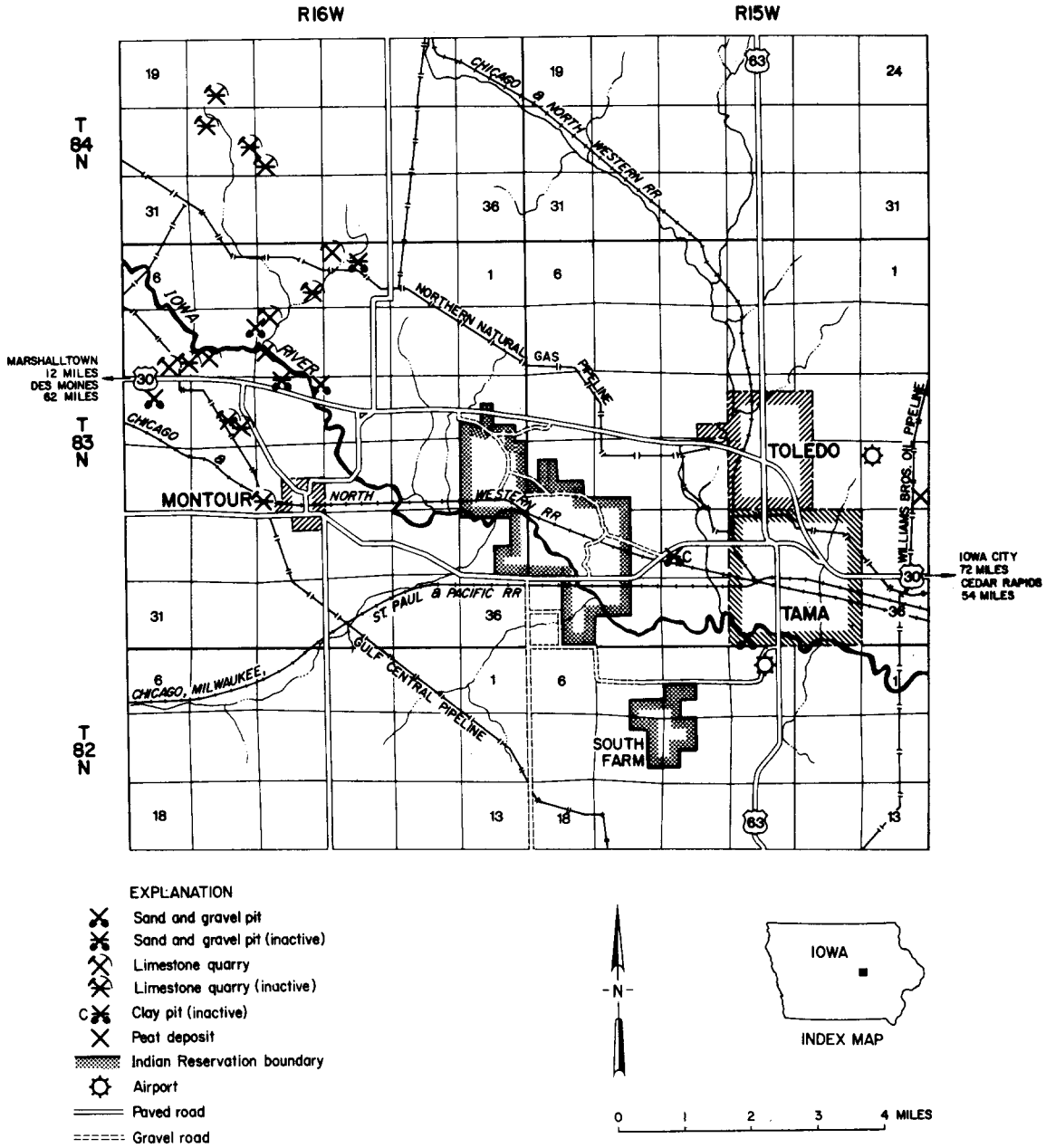

Figure 1. Location and mineral activity map of the Sac and Fox Indian Reservation and vicinity, Iowa.

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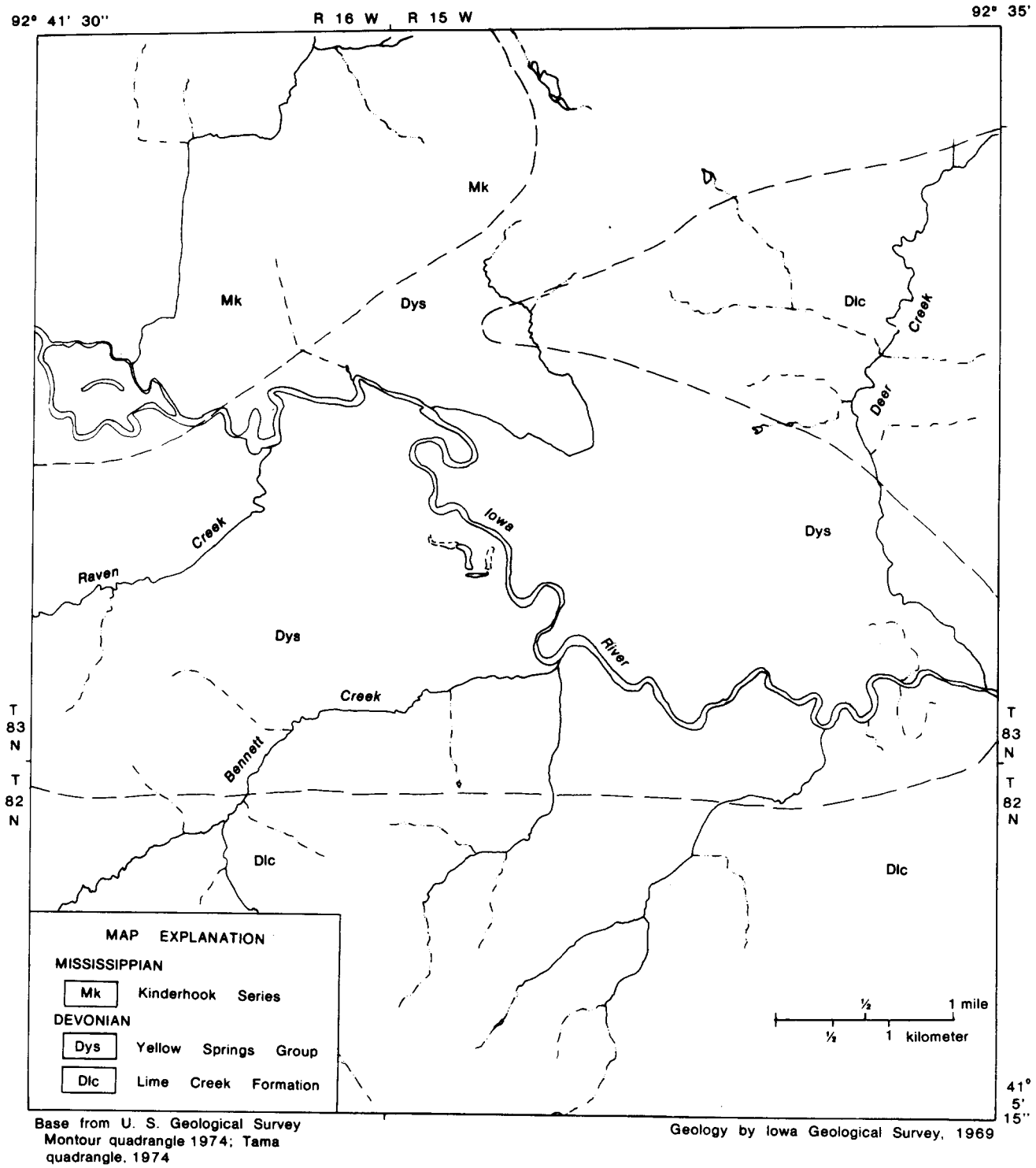

Figure 2. Generalized geologic bedrock map of the Sac and Fox Indian Reservation and vicinity, Tama County, Iowa.

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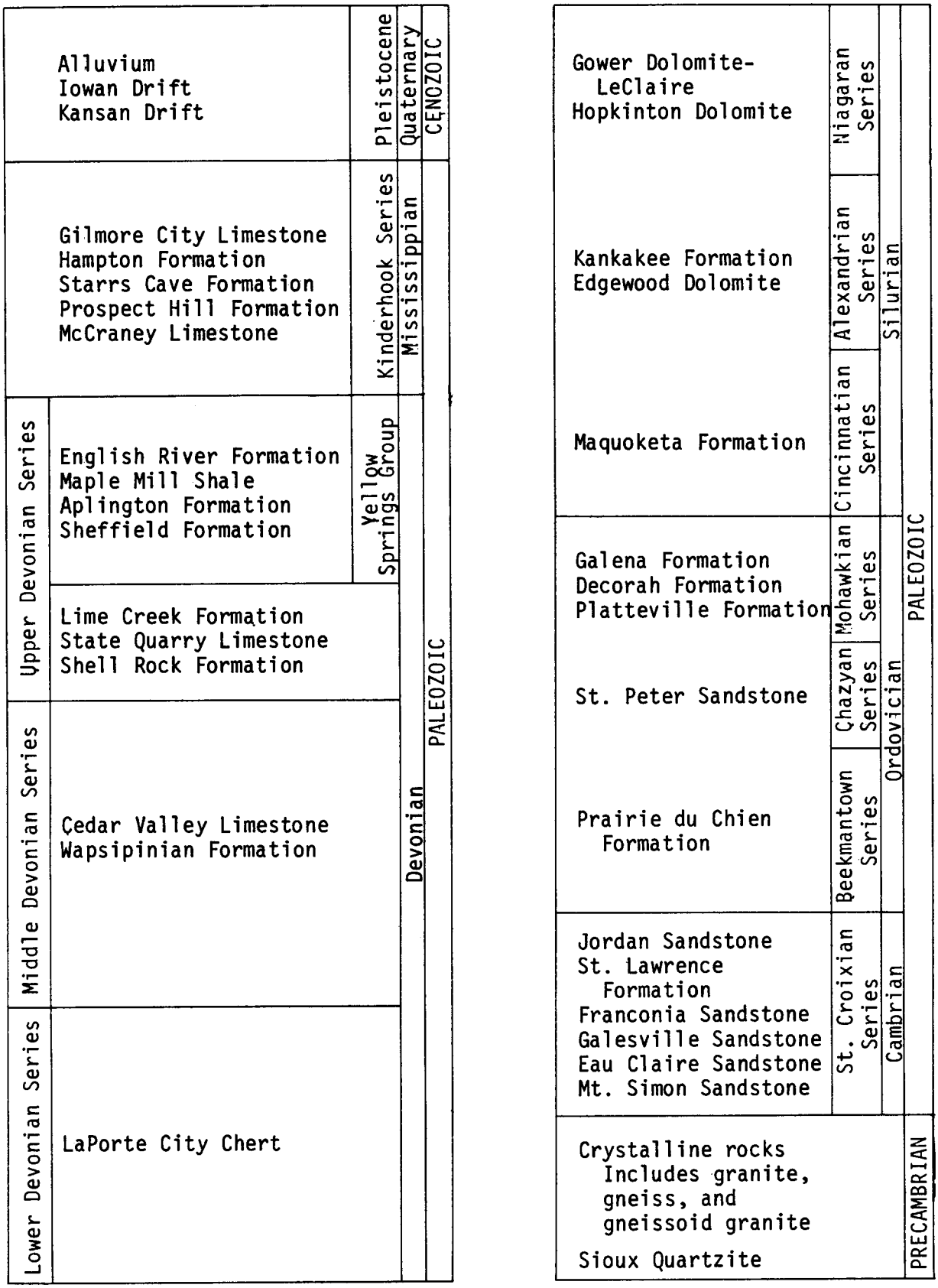

Figure 3. Generalized stratigraphic section of rocks present in Tama County, Iowa (Iowa Geological Survey, 1969).